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COMMISSION

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Arterial Operations Committee (AOC)

10:15 A.M. - 12 P.M., Tuesday, May 10, 2016
(10:00 – 10:15 A.M. Networking Time)
Lawrence D. Dahms Auditorium
Metropolitan Transportation Commission
101 Eighth Street, Oakland, CA 94607

Chair: Obaid Khan, City of Dublin
Vice Chair: David Huynh, Iteris
Staff Liaison: Linda Lee, MTC
Virginia Lingham, MTC

For more information, please visit the Arterial Operations website at:
http://www.mtc.ca.gov/our-work/operate-coordinate/arterial-operations

Meeting Agenda

1. **Introductions (Obaid Khan)** 10:15 a.m.
   a. *Meeting Notes from March 8, 2016**
2. **Arterial Operations Committee Activities and Updates** 10:20 a.m.
   a. *Member Announcements, Reports, Updates, Upcoming Events*
   b. *PASS FY15/16 Project Status**
3. **Arterial Operations Program Funding Updates** 10:40 a.m.
   a. *Fixing America's Surface Transportation (FAST) Act/OBAG2 Follow-up (Linda Lee, MTC)*
   b. *FAST Act/ATCMTD (David Huynh)**
4. **New Technologies for Arterial Operations**
   a. *NextGen Arterial Operations Program (NGAOP) Project Status (Linda Lee, MTC)** 11:00 a.m.
   b. *NGAOP Evaluation Plan Status for Fremont and Santa Clara County Projects (DKS)*
   c. *Connected Vehicle Program Update (Virginia Lingham, MTC)**
   d. *San Francisco's Smart Cities Challenge Update (Virginia Lingham, MTC)**
5. **Featured Presentation** 11:30 a.m.
   INRIX Analytics Demonstration and Its Applicability to Arterial Management
   (Gary Carlin, INRIX, and Curt Harrington, Parisi Transportation Consulting)
   An overview of INRIX capabilities on arterial roadways will be presented, as well as a discussion of anticipated enhancements to their data analytics packages with a focus on arterial applications. This overview will be followed by a real-world demonstration of how INRIX data can be used by local agencies to evaluate arterial system operations.
6. **Adjournment (Obaid Khan)** 12:00 p.m.
   *Next Meeting: Tuesday, July 12, 2016 @ 10:15 A.M. at **375 Beale Street, San Francisco***

*Attachment included

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Arterial Operations Committee

Notes from March 8, 2016 meeting

1. Introductions

Meeting called to order at 10:20 A.M. in Conference Room 171 of the Joseph P. Bort MetroCenter. All members introduced themselves.

a. Meeting notes from the January 10, 2016 meeting were approved without any changes.

Linda Lee (MTC) informed the AOC members that the official MTC move date to San Francisco had been postponed to a later date – most likely sometime in May. Linda will look into location options for the May AOC. The group discussed the possibility of making future AOC meetings available via WebEx or GoToMeeting. There is strong interest in making the meetings available through alternate formats, which could increase participation from members.

2. Arterial Operations Committee Activities and Updates

a. Saravana Suthanthira (ACTC) provided AOP Task Force background information. The group reviewed the Task Force Activities table provided in the packet.

Saravana explained that updates to the BASIS database would now be initiated by the CMAs on an annual basis. MTC will be seeking input from the local agencies regarding the final list of attributes that will be included in the database. Members expressed interest and need for the regional database, and wanted to make sure the database is accessible to everyone. Eugene Maeda (VTA) said the database will be a useful tool for seeing what equipment other agencies have in the field. Linda cautioned the group that when using the database, users must keep in mind that the data will only be updated on an annual basis. While this database is a good starting point, users should still follow-up with the agency who owns the equipment to verify the information is accurate and up-to-date.

Saravana highlighted the AOC outreach flyer that was included in the packet. She emphasized the need for increased public sector participation at the AOC meetings. The intention of the flyer is to distribute it to the local agencies through the CMA TAC meetings in order to attract new interest and participation. Obaid emphasized that member participation is critical and encouraged the group to share the flyer through their networks and, if possible, to bring a colleague from neighboring agencies to the next AOC meetings.

Discussion ensued regarding making the meeting available via webinar, video conference, at a more central location, or at alternating locations around the region.

Linda noted the high attendance of public sector members at today's meeting. She expressed her appreciation for their participation and asked some of them to share their reasons for attending today:

- Angela Oboso (City of Menlo Park) shared that their department's transportation group has doubled from four to eight, so they have more resources to send to meetings like these, and anticipates being more active in 2016.

- Tawfic Halaby (City of Richmond) explained that the current traffic engineer is retiring, so he is filling in. He hopes to attend more meetings in the future.

- Ken Jung (City of San Jose) reported that there has been some recent staff turnover, but now there is new staff within their department. So they will try to send representation to future meetings.

Brian Burkhardt (Jacobs) asked how this group can influence funding decisions, and whether those decisions are being made at the Commission level. Linda suggested that one effective way is for AOC members to voice their ideas and recommendations directly to the various MTC standing committees, either in writing or in person at the meetings. Decisions are made at either the Committee or Commission level. Obaid also suggested that all AOC members bring their ideas to this group, so the AOC can strive to coordinate and work together to address various concerns. He continued that the AOC is a forum to share ideas and engage in a dialog.

b. Linda reported that everything is going as planned with the 2015-16 PASS Projects and that the updates are included in the packet.

   Linda reported that the 2016-17 PASS Call for Projects document is expected to be released by the end of the month. She explained that the guidelines, specifically the eligibility requirements and local match levels, have been updated from what was included in last year's Call for Projects, and that the budget for the 2016-17 PASS Program should be about $1,000,000.

c. Obaid provided information regarding changes to the CEQA analysis requirements (SB743). He explained that ITE Western District is very engaged in this process and encouraged interested parties to review a letter that ITE Western District had prepared. Obaid will forward a copy of letter for inclusion in these notes. Lin Zhang (TJKM) also announced that there will be an SF Bay Area ITE Seminar in May to provide more information about the topic and better understand the changes.

   Tawfic Halaby announced two new developments that are happening within Richmond: 1) The City is getting a ferry. The ferry service is expected to be operational in 2017; and 2) Richmond was selected as the site for UC Berkeley's Global Campus, which will redevelop the existing Richmond Field Station. The project is being added to their 20-year plan.

Arterial Operations Committee

Notes from March 8, 2016 meeting

3. Arterial Operations Program Funding Updates

Obaid led the discussion about various new funding opportunities that could potentially be available for arterial operations. For example, there could be an additional $40M for OBAG2 due to additional FAST Act funding coming to the region. The group believes that it would be beneficial to use this funding to supplement the Arterial Operations Program. Brian Burkhardt asked if the funding is available at a broad level or for specific projects. Linda replied that the priority would likely be given to specific projects that can demonstrate GHG emission reductions. Obaid said it would be a good idea to send a letter, on behalf of the AOC, to the MTC Commission to advocate for additional funds for the Program. Linda also suggested that local agencies advocate to their respective CMAs.

4. New Technologies for Arterial Operations

a. Linda reported that the Next Generation Arterial Operations Projects are all moving along with their deployments. For both the AC Transit and LAVTA projects, we are working on the adaptive system procurement documents; the City of Fremont recently selected an adaptive vendor; and Bluetooth readers have recently been installed for the Santa Clara County project.

b. Virginia discussed the items included in the Connected Vehicles memo that was included in the packet. This month's memo highlighted two MTC led initiatives that are moving forward in an effort to advance connected vehicles in the region: 1) A hackathon to enable programmers and developers to create apps that can encourage smarter and safer driving behaviors; and 2) an evaluation of Transit Signal Priority on the Connected Vehicle test bed along El Camino Real. Obaid commented that he is looking forward to seeing FHWA's Vehicle-to-Infrastructure (V2I) Deployment Guidance document soon, as it will be an important document that will help him plan for the near future and become CV-ready.

5. Featured Presentation

Dr. Zong Tian, Professor & Director for Center for Advanced Transportation Education & Research (CATER) provided an overview and demonstration of a software tool called TranSync. This software was developed to meet the challenges of the four critical aspects of signal timing and coordination: management, optimization, diagnosis, and evaluation. A copy of Dr. Tian's presentation is attached to these notes.

The presentation was followed by an engaging discussion about future application of TranSync to help the local agencies in the region.

In addition, Dr. Tian's presentation about Adaptive Signal Control that was mentioned during his presentation can be watched in the following link:
https://www.youtube.com/watch?v=L9l5bs1ucRs#action=share

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6. Focused Group Discussion

The intent for the group discussion was to discuss the ongoing regional ITS Architecture update. Matt Weatherford with Iteris is the consultant leading the ITS Architecture updates and Nisar Ahmed is the project manager from MTC. Virginia encouraged the group to fill out the survey that was provided via email and to participate fully in the update discussions. She continued that an accurate architecture will make it easier to seek federal funding for our technology projects in the future and will also ensure interoperability of systems across the region.

7. Adjournment

The meeting adjourned at 12:10 P.M. The next meeting will be held on Tuesday, May 10 2016 at 10:15 A.M. The location will be announced as soon as possible.

Arterial Operations Committee

Notes from March 8, 2016 meeting

Arterial Operations Committee (AOC) Sign-In Sheet

Tuesday, March 8, 2016

Name	Agency	Phone No.	E-Mail
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February 29, 2016

Christopher Calfee, Senior Counsel
Governor's Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

Re: Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA – Implementing Senate Bill 743 (Steinberg 2013)

Dear Mr. Calfee:

Thank you for the opportunity to provide comments and suggestions regarding your efforts to amend CEQA (California Environmental Quality Act) Guidelines, as required by Senate Bill 743 (SB 743). This letter specifically responds to the report titled "Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA – Implementing Senate Bill 743 (Steinberg 2013)" written by the Office of Planning and Research (OPR) dated January 20, 2016 (hereafter called the "Revised Proposal").

We represent over 2,000 California members of the Institute of Transportation Engineers (ITE), an international society of transportation engineers and planners. These members prepare transportation analysis for environmental documents under CEQA, and in some cases the National Environmental Policy Act (NEPA), and we understand the purpose of these analyses to identify potential environmental impacts.

This is our third comment letter to OPR since the SB 743 process started in the fall of 2013. In addition to seeking written comments, we appreciate OPR's spirit of openness and cooperation throughout this process. OPR staff have spoken at numerous ITE events and OPR has conducted numerous individual conversations with ITE members.

We believe that the implementation of SB 743 will involve significant challenges and we look forward to OPR's continued cooperation during the implementation process.

Our purpose in writing this letter is to provide recommendations for revisions to the Revised SB 743 Guidelines in order to achieve a more successful implementation of SB 743. Included are overall comments as well as detailed comments relating to specific aspects of the Revised Proposal.

OVERALL COMMENTS

The revised proposal represents a step forward since it addresses many (but not all) of the concerns raised after preparation of the draft guidelines in August 2014. The Revised Proposal provides for a two-year opt in period which will be helpful in reducing the disruption that is expected to be caused by the transition to a very different way of evaluating the transportation impacts of projects under CEQA. Many aspects of the Revised Proposal reflect consideration of important details not considered in previous draft guidelines. Our comments, as described below, are designed to assist OPR in continuing to make improvements while working toward a final set of SB 743 guidelines.

DETAILED COMMENTS

Our additional comments are as follows:

1. General, Goods Movement: The Revised Draft does not include information on how to handle VMT analysis with respect to goods movement. We would like to take this as an indication that goods movement operations would not need to be analyzed with respect to VMT analysis and would not cause a significant VMT impact. However, a statement to this effect in the guidelines would be helpful. Our assumption would be that employee trips and other passenger vehicle trips related to goods movement would be analyzed for VMT considerations.

2. Page 1, Second Paragraph: The comment that the guidelines can be updated as needed is welcome as experience in conducting CEQA transportation analyses after the incorporation of SB 743 may lead to a need for adjustments.

3. Page 1, Third Paragraph: The statement that traffic studies "will now typically take days rather than weeks to prepare" is questionable, given the uncertainty in how lead agencies will respond to the implementation of SB 743. We would recommend saying that this is OPR's expectation.

4. Page 2, Second Paragraph: This paragraph provides the first of many references to the Caltrans Statewide Travel Demand Model. The first two case studies shown at the end of the Revised Proposal also rely heavily on data from this model. ITE agrees that the Statewide Travel Demand Model can be a useful tool in VMT analyses, particularly in cases where local models are not may not be available or appropriate for use on a particular project. However, this

model is not easily available to most transportation analysts and it is not practical to run the model for most projects. Therefore, what is needed are tables, figures, and or a database that allow analysts to determine average vehicle trip lengths for residential and office land uses by travel analysis zone and by region for the entire state. In the case of residential land uses, this information is also needed by City and for the unincorporated areas of each County. We would request OPR's assistance in making sure that this information can be made available to analysts who conduct CEQA transportation analyses for land development projects.

5. Page 3, Item 3 and Page 23, Third Paragraph: For residential developments in unincorporated areas, VMT impacts should be determined using a threshold that is 15% below the average of all the unincorporated areas in the county (in addition to the regional average), not the incorporated cities. It is not fair or reasonable for unincorporated/rural areas to be compared to more densely developed incorporated areas.

6. Page 4, Item 7: Is there a way to re-word this without use of a double negative?

7. Page 7, Item (b) (1): Given that some development projects will fall partly within and partly outside the specified distances to transit, guidance for projects in this situation may be helpful. One suggestion would be to use language similar to Public Resources Code 21555(b), e.g., something similar to "A project shall be considered to be within one-half mile of a major transit stop or high-quality transit corridor if all parcels within the project have no more than 25 percent of their area farther than one-half mile from the stop or corridor and if not more than 10 percent of the residential units or 100 units, whichever is less, in the project are farther than one-half mile from the stop or corridor."

8. Page 8, (c) Applicability: The two-year period from adoption to implementation statewide is appropriate and should be retained. In order to achieve as smooth an implementation process as possible, lead agencies will need time to review their current laws and policies, conduct relevant studies, and implement new laws and policies that are consistent with the implementation of SB 743.

9. Page 8, XVI (a): The Appendix G checklist item (a) is proposed to read "Would the project conflict with a plan, ordinance or policy addressing safety or performance of the circulation system, including transit, roadways, bicycle lanes and pedestrian paths (except for automobile level of service.)?" We believe this checklist item is not needed. Safety is adequately addressed under current item (d) that reads "Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?" Performance of the circulation system, which had typically been measured with level of service, no longer needs to be mentioned. Furthermore, a mere conflict with unspecified documents should not be considered an environmental impact. With so many design documents

available, there are certain to be conflicts, so defining a conflict as an impact would trigger many EIR's.

10. Page 8, XVI (c): Checklist item (c) should make clear that induced demand would be significant only if a transportation project is of a scale large enough to affect California's attainment of long term greenhouse gas emissions goals.

11. Page 18, Recommendations Regarding Significance Thresholds: Clarification should be given as to whether the baseline/existing conditions should be the average VMT at a fixed point in time. If the goal is to reduce VMT by 15% from today's existing conditions, then the baseline should not need to be re-established at the beginning of project analysis as practice currently dictates for evaluation of LOS impacts.

12. Page 18, Recommendations Regarding Significance Thresholds: It would seem to make sense that long-term or phased projects would analyze VMT impacts at the time the proposed development is expected to be implemented. This raises the question of whether a project could calculate its VMT impacts using the transportation network that would be expected to be present on its opening day and whether any proposed improvements in the transportation network would need to be funded or only planned without an identified funding source.

13. Page 21, First Paragraph: While it is useful to provide a minimum threshold for the consideration of VMT impacts in the SB 743 guidelines, we believe that a higher threshold would be more appropriate. In our experience, the most commonly-used thresholds for current traffic impact studies are 50 peak hour trips/500 daily trips or 100 peak hour trips/1,000 daily trips. We believe these thresholds would also be appropriate for VMT analysis. Consideration could also be given to using a higher threshold for projects that are consistent with an agency's General Plan or the regional RTP/SCS. For comparison, there are many agencies that use higher thresholds for screening projects. For example, the Orange County CMP uses a threshold of 1,600-2,400 daily trips, San Bernardino County uses 250 peak hour trips, and the San Diego Regional Traffic Impact Study Guidelines use 2,400 daily trips or 200 peak hour trips. It should be noted that the threshold of 100 daily trips could require a project as small as ten dwelling units to conduct a full Environmental Impact Report if a significant VMT impact is determined.

14. Page 23, Office Projects: In some cases, it may be appropriate to compare office VMT generation per employee to City or unincorporated County averages rather than regional averages. Individual lead agencies may want to consider this and it would be helpful if the draft guidelines would acknowledge this possibility.

15. Page 23, Office Projects: Office projects that improve jobs/housing ratio balance may act to reduce VMT if they provide jobs for local residents who would otherwise commute long distances. This effect should be taken into account when evaluating the VMT impacts of office projects.

16. Page 24, First Paragraph: For retail developments, assessing the total change in VMT would require use of a model to determine the existing VMT for the project area. This may place a significant burden on projects just above the recommended screening threshold of 50,000 square feet.

17. Page 24, Other Project Types, Second Paragraph: We would recommend deletion of this paragraph. The paragraph currently says "Strategies that decrease local VMT but increase total VMT, for example strategies that forego development in one location and lead to it being built in a less travel efficient location, should be avoided." This is implying that a project may push other development to a location such that future overall VMT is increased. However, it may be likely that no such diversion will ever occur. The logical approach would be to analyze the impacts of the diverted project when that project is proposed.

18. Page 25, Rural Areas Outside MPOs: This heading should be changed to “Rural Areas”. The important consideration is an area’s status with regard to reducing VMT, not whether it happens to fall within an MPO or not. Similarly, the first sentence should be changed to read “In rural areas (i.e. areas not near developed cities or towns)”. The definition of rural in relevant transportation engineering publications may be helpful. For example, the 2010 Highway Capacity Manual defines rural as “an area with widely scattered development and a low density of housing and employment”.

19. Pages 28 to 34, Induced Demand: Many ITE members disagree with the concept of incorporating induced demand into the analysis of transportation impacts of roadway projects. While it is recognized that new roadways or capacity-increasing projects can increase the desirability of development in areas served by the roadway in question, many of us would prefer to attribute any increases in VMT with the development rather than the roadway. To the extent that induced demand is included in the guidelines, we have comments that follow below on how this issue should be analyzed.

20. Pages 28 to 34, Induced Demand: The technical Advisory should make clear that the suggested induced demand elasticity rate of 1.0 is used only as an example. We recommend that OPR give EIR preparers discretion to select the appropriate elasticity.

21. Pages 28 to 34, Induced Demand: For most roadway projects, simple sketch planning tools will be the appropriate method to estimate induced demand. For example, page 29 of the Revised Proposal, first paragraph, refers to a range of elasticities for VMT from 0.6 to 1.0 (i.e. a 0.6 to 1.0 percent increase in VMT for every 1.0 percent increase in lane miles). The Roadway Capacity Expansion Project case study uses the midpoint of this range (0.8) and that would be a reasonable choice for most roadway projects. In addition, we would recommend that OPR include the checklist described below to allow analysts to screen out projects that would not be appropriate for induced demand analysis.

22. Pages 28 to 30, Induced Demand: Induced demand is only relevant if traffic congestion is a factor and if the geographic area served by the new or expanded roadway is appropriate for development. ITE recommends adding a checklist to the Revised Proposal that lead agencies would review prior to conducting an induced demand analysis. The check list items include:

(1) Are there alternative competing modes in the project corridor, and are travel times competitive with the existing/proposed auto travel times?
(2) Is the economy of the area expected to grow significantly in the next 20 years?
(3) Does the present zoning near the project allow for additional development?
(4) Is there significant congestion on the roadway network now?
(5) Are parcels suitably sized to provide for new development along the project corridor (i.e., no extensive assembly of parcels required for increased development)?
(6) Are topography, land ownership, governmental services, absence of ground contamination, and other factors conducive to new development?
(7) Is there community support and market demand for new development?
(8) Is the project on the fringe, or just beyond, the existing urban area?
(9) Is the project likely to generate significant travel time reductions (greater than 5 minutes during peak hours)?
(10) Is the project likely to result in newly generated trips due to increased access to employment sites or shopping destinations beyond what would be expected through reassignment of traffic?

If most of the answers to these questions are "no," there is probably not a significant amount of induced demand likely in the long term.

23. Page 27, Fifth Bullet: Change the last part of this bullet to read “provided that the project includes appropriate facilities for pedestrians, cyclists, and, if applicable, transit”. A small roadway project would generally generate an insignificant amount of VMT because it is small, regardless of whether it can or cannot substantially improve conditions for pedestrians, cyclists, and transit. Such projects should include appropriate facilities for all modes of travel without the burden of requiring to demonstrate a substantial improvement.

24. Page 28, Evidence of Induced VMT, First Sentence: At the end of the sentence add "in congested areas". A statement should also be included saying that the addition of lanes for safety or other reasons in uncongested areas will generally not lead to induced VMT.

25. Page 29, First Paragraph: It should be made clear that the elasticity values noted in this paragraph are just examples and elasticity should be evaluated on a case-by-case basis. This paragraph includes a statement that "(An elasticity greater than 1.0 can occur because new lanes leverage travel behavior beyond just the project location.") This statement should be deleted or should be accompanied by a more thorough explanation. What precisely does "leverage" mean? One way to solve this problem would be to simply delete the wording in quotes and let individual analysts look into the relevant research to determine how it could be applied to individual projects.

26. Page 29, First paragraph: We would like OPR as well as other readers of this letter to be aware of some of the characteristics of the Duranton and Turner research cited in this paragraph:

(1) The authors (Duranton & Turner) focus mostly on interstate highways. Users of this report should consider the transferability of results to other types of streets (adding a lane to an arterial might have different impacts than adding a lane to an interstate). In California in particular, there is a fairly large system of non-interstate freeways (in 2013, FHWA *Highway Statistics* said 54% of the urban freeway+expressway mileage in California was non-interstate).
(2) Despite some efforts to control for it, Duranton & Turner may be confusing correlation with causation (does capacity induce VMT? or does VMT induce areas to provide capacity?).
(3) Duranton & Turner state unequivocally that, "...we find no evidence that the provision of public transportation affects VKT [VMT]." (page 2618). Doesn't that negate some of the suggested mitigations OPR lists later?
(4) In their conclusion, Duranton and Turner note with 'surprise' that National Personal Travel Survey (NPTS) data show a decline in driving distances per person, per household, and per vehicle between 1995 and 2001 (page 2647). This despite the fact that lane-miles of interstate supplied increased in this period, which would seem to negate the other conclusions of the paper.

The full citation of this paper should be included in the SB 743 guidelines. It is shown here for reference: Duranton, Gilles and Matthew A. Turner. "The Fundamental Law of Road Congestion: Evidence from US Cities." American Economic Review 101 (October 2011), pages 2616-2652. www.aeaweb.org/articles.php?doi=10.1257/aer.101.6.2616

27. Page 30, Recommended Significance Threshold for Transportation Projects: This section provides a much-needed VMT significance threshold for transportation projects. It should be noted that while 2,075,220 is a comparatively large number compared to most numbers used in day-to-day discussions, it is really quite small when translated into its relation to roadway facilities. Assuming 365 days in a year and an equal distribution of VMT over the days, this is only 5,685 VMT per day. A roadway that is one mile in length that carries over 5,685 vehicles per day would exceed this threshold. Using this threshold, even moderately small roadway improvement projects would exceed the threshold requiring the identification of a significant VMT and a need to consider mitigation. Any efforts to reduce or eliminate this threshold should be resisted.

28. Page 34, Mitigation and alternatives, Fourth Bullet: Change this bullet to read "Implementing Intelligent Transportation System (ITS) strategies". ITS strategies can achieve objectives other than increasing throughput and increases in automobile throughput would seem to be contrary to the objectives of the other bullets.

29. Page 34 to 45, Analyzing Safety Impacts Related to Transportation: The Technical Advisory on safety impacts starts off providing a little bit of guidance on thresholds, but beginning at the top of page 35 transforms into ten pages on how roadway and traffic ought to be designed. Within our industry, we would say OPR is overreaching. The fact that these opinions on traffic safety are placed in the Technical Advisory, rather than regulation, does not lessen the fact that they are still part of the CEQA Guidelines. The implication is that a project has an environmental safety impact unless lanes are narrowed, traffic signal cycles are reduced to less than 90 seconds, sprawl is reduced, and other strategies that ignore context and are not applicable throughout all parts of the state. Pages 35 to 45 in the Technical Advisory would become EIR and negative declaration triggers. They should be deleted.

30. Page 34 to 45, Analyzing Safety Impacts Related to Transportation: ITE has recommended deleting most or all of this information. The Technical Advisory would be much more useful with citations of case law regarding transportation impacts on safety rather than of controversial academic research. If our recommendation is not accepted, we have comments on how the current wording could be improved, as described below.

31. Page 34, Analyzing Safety Impacts Related to Transportation, Fourth Paragraph: Change "roadway users" to "travelers". Change "guidance on how to approach" to "information that will be helpful in conducting".

32. Page 34, Last Bullet: This bullet should be deleted. We are not aware of any transportation safety issues that affect just one individual.

33. Page 35, Second Bullet: Change “not undermine” to “avoid undermining”.

34. Page 36, Second Paragraph: Change “straightening roads does not increase safety” to “straightening roads may not increase safety”. Similar wording changes should be considered throughout the safety section to create an advisory that is factual rather than speculative.

35. Page 38, Second Paragraph: ITE recognizes the value of narrowing lane widths in certain cases to provide traffic calming and to allow roadway right-of-way to be used for non-auto uses. However, it should be recognized that safety depends on context. For example, a 10-foot curb lane raises the risk of conflict between pedestrians and transit buses with a mirror-to-mirror width exceeding 10 feet. Statements implying that wide lanes are an environmental impact are not helpful.

36. Page 38, Second Paragraph: Change “wider lanes hinder” to “wider lanes may hinder”.

37. Page 39, Protecting Vulnerable Road Users, First Paragraph, Last Sentence: Change “should not reduce active transportation” to “avoid reducing active transportation”.

38. Page 39, Last Paragraph: Delete “and the resulting ‘safety in numbers’ ”. This statement is considered to be controversial and unnecessary.

39. Pages 40 to 42, Reducing Overall VMT and Sprawl: The relationship between collisions and VMT is well accepted. In fact, collision rates are calculated using VMT or intersection volumes as the denominator. However, the relationship between collisions and sprawl is less defined. This section seems to imply that a sprawl index needs to be calculated to determine whether safety is impacted. We suggest reducing the length of this section to avoid the implication, including deletion of the sprawl index table. The VMT-related guidelines effectively address sprawl, but entangling sprawl with safety means that any project in the exurbs has a safety impact.

40. Page 41: Emergency access merits its own section in the technical advisory, given that the checklist still asks "Would the project result in inadequate emergency access?" The proposed guidelines imply that sprawl is a problem but urban congestion is not, which is untrue. Lead agencies need guidance on how to deal with this.

41. Page 41, bottom, Analyzing Safety Impacts Related to Transportation: Guidance on impacts to emergency access is weakly addressed in the Technical Advisory. The only mention of emergency access is a statement that emergency access suffers more from sprawl than from congestion. Leaving that statement as the only guidance is misleading. Emergency access still

has its own checklist bullet, so it deserves a dedicated section in the Technical Advisory. Citations of case law, such as *City of Hayward vs. Board of Trustees of California State University*, would be far more useful in the Technical Advisory than mentioning academic research.

42. Page 42, Attribution of Safety Impacts: This section should be deleted. Its main point appears to be that safety impacts should be attributed to the projects that caused them. This seems to be obvious and does not need to be re-stated. The information provided regarding modeling errors in traffic volumes is not supported and is not helpful.

43. Page 42, Attribution of Safety Impacts: If this section is retained, we would suggest a different example besides turn pocket queue overflow as a safety problem. That situation has a relatively small risk of fatality or serious injury. Inclusion of this example implies this kind of analysis is necessary for CEQA.

44. Pages 42 to 45: Addressing Tradeoffs and Finding Win-Win Safety Improvements: This section is unnecessary and should be minimized, if not deleted. Transportation engineers and roadway designers are well aware of tradeoffs needed to balance the desires of motorists, transit users, pedestrians, cyclists, urban designers, landscape architects, the fire department, the police department, businesses, residents, school districts, and the disabled, as well as the need to conform to design standards, the Americans with Disabilities Act, and the various funding requirements for grants. As an example, meeting the demands of several of the aforementioned parties is the reason a pedestrian must wait over two minutes to walk across a street, and has to push a button to get the OK. It isn't because transportation- engineers think it's safe. Having design suggestions in the CEQA Guidelines is, to say the least, not helpful. What is missing from the safety section is guidance on a threshold of significance. The guidance could be as brief as a checklist item asking "Would the project cause a substantial degradation in the safety of the circulation system, including transit, roadways, bicycle lanes and pedestrian paths?" The Technical Advisory safety section could then clarify that if safety doesn't degrade, there is no impact. As it reads now, the safety section is implying that unless speeds are lowered, lanes are narrowed, and sprawl is reduced, the project has a safety impact.

45. Page 43, Item (2): “Surface roadway lanes can be redesigned from traditional 12.0 foot widths to with [sic] 9.2 to 10.8 foot widths…” Could OPR provide a source for this statement? “Karim (2015)” is cited at the end of the paragraph, but no further information on this reference is provided for this article. Although there have seen studies indicating that narrower lanes (typically 10-11 feet) have minimal impacts on safety, it would be useful to have this citation for lane widths under 10 feet. California law currently allows vehicles to be 8.5 feet wide, exclusive

of mirrors. Mirrors may project out another foot on each side, so inclusive of mirrors, a truck or bus perfectly centered in its lane may be 10.5 feet wide including mirrors. Also, it should be noted that most experts believe that these narrower lane widths should be used only on streets with a speed limit of no more than 40 or 45 mph.

46. Page 44, Third Bullet: Change "Signal lengths of greater than 90 seconds" to "Inappropriately long signal cycle lengths".

47. Page 44, First Paragraph, Second Sentence: Change "examples of mischaracterization" to "examples of possible mischaracterization" in order to be consistent with the text prior to the list of possible detriments to safety.

48. Page 47, Case Studies: The three case studies shown in this section are helpful. It is noted that two of the case studies recommend consideration of mitigation measures that are not considered practical given current technical, political, and economic factors. The Mission Viejo Medical Center recommends a $6 per day parking charge, which is considered to be infeasible in an area where neighboring developments offer employee parking for free. The Kern County Roadway Expansion Project recommends consideration of tolls and other strategies. Toll roadways have been implemented in only a few highly urbanized areas of California and only on freeway-type facilities. It is highly unlikely that a toll strategy could be successful in Kern County or other similar areas of the state. We believe that these two case studies illustrate some of the difficulties in implementing SB 743. While some projects may be able to be designed to avoid VMT impacts or may be able to provide off-site mitigation, there will be large numbers of projects that will be unable to mitigate their VMT impacts and will need to seek a statement of overriding considerations if they are to move forward. This comment is not intended to argue against the implementation of SB 743, but rather to help manage expectations about the ability to fully mitigate the VMT impacts of projects.

49. Page 47, Case Studies: ITE would be interested in a case study that would respond to the example described in Additional Comment 6 from our November 21, 2014 comment letter on the August 2014 draft guidelines. That example had a project that generates a large amount of greenhouse gases being insignificant while a smaller project is significant using a per capita-based threshold.

50. Page 47, Case Studies: It would be helpful to add a case study for a special event facility such as an arena, stadium or similar use.

51. Page 48, Mixed Use Project Case Study: It is unclear how the calculations were made outside of CalEEMod. This case study would be improved if further clarification could be provided.

52. Page 53, Medical Office Case Study: This case study is helpful and it is recognized that it is only intended as a sample calculation. However, VMT analysis can involve many considerations and ITE members who have reviewed this case study have raised some additional considerations that could affect the calculations regarding VMT generation and VMT mitigation.

(1) Medical office buildings are different from typical office buildings in that they have a lot of trips made by visitors/patients. This leads to different travel behavior and more accurate calculations may result from tailoring the analysis to medical office buildings.

(2) With respect to the mitigation measures, the VMT reduction associated with a transit subsidy for employees may be dependent on the quality of transit service provided. This particular site is not served by a robust transit system and may have difficulty achieving the recommended reduction. In addition, transit may be less applicable to patients/visitors than employees.

(3) The 9/80 work week and the carpool vanpool mitigation may also be less applicable to a medical office than a typical office building.

53. Page 55, Roadway Capacity Expansion Project Case Study: ITE has some comments and questions regarding this case study.

"Lane mile and VMT data are available from the Caltrans Performance Measurement System (PeMS):" We searched the PeMS website on 2/5/16 and were unable to locate either the lane miles or VMT noted for the Kern COG. It would be helpful if the guidelines could provide a link to the applicable website.

The calculation of the percentage change in lane miles (0.328%) is not, strictly speaking, correct. Nearly every economics text recommends the use of an arc elasticity that considers the average value of the independent variable (in this case, lane miles), not the starting value. Otherwise, a 2.2 lane mile increase and a 2.2 lane-miles decrease give you different answer. This problem increases as the magnitude of the change increases. A simple example may illustrate this point: going from 50 to 75 is a 50% increase, but a change from 75 to 50 is a 33.3% decrease, even though both involve a change of 25).

The correct arc calculation should be (using LM to stand for lane-miles):

$$\frac{\text{Project added lane-miles}}{(\text{"Before project" LM} + \text{"After project" LM}) / 2}$$

While the difference is minimal for such the example small change in lane miles (a third of a percent), it is more important with larger changes in lane miles. We recommend that OPR use the formula use in virtually all economic texts. This would require the example to document the number of project lanes-miles before and after the proposed roadway expansion.

Several transportation publications explain this difference and the correct calculation of an elasticity. For example, see Donald R. Rothblatt and Steven B. Colman, "Impacts on Ridership of Bus Fare Changes in Small to Medium Urban Transit Systems," San Jose State University Institute for Metropolitan Studies, September 1997, especially pages 2 thru 8. Also, Richard H. Pratt, "Traveler Response to Transportation System Changes," available online at http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_webdoc_12.pdf, especially "Appendix A-Elasticity Discussion and Formulae" and pages 1-13 thru pages 1-16 (first chapter of document).

54. The following additional case study provided by ITE indicates that the recommendations provided in the Revised Draft may result in some projects with small VMT increases showing a significant VMT impact while some projects with large VMT increases may show an insignificant impact. This is shown in the VMT calculations for Project A and Project B below:

PROJECT A

Urban in-fill/transit priority area project on a 10-acre site
500 du of very high density apartments
Daily Trips = 2,100 trip-ends per day
VMT/person = 8 VMT/person
Persons/du = 2 persons/du
TOTAL DAILY VMT = 8 VMT/person x 2 persons/du x 500 du = 8,000 VMT/day

PROJECT B

Suburban/rural single family residential project on a 10-acre site
12 du of very low density residential (one acre lots)
Daily Trips = 114 trip-ends per day
VMT/person = 20 VMT/person
Persons/du = 4 persons/du
TOTAL DAILY VMT = 20 VMT/person x 4 persons/du x 12 du = 960 VMT/day

Regional/City wide Average VMT/person = 16 VMT/person

Both projects would propose to develop 10-acre site. Project A would add 8,000 VMT per day, but may be considered to have an insignificant impact. Project B would add 960 VMT per day, but may be considered to have a significant VMT impact. It is recommended that agencies working with VMT thresholds consider this example, since working with averages can lead to misleading results, depending on how the averages are used.

This letter was prepared by the California SB 743 Task Force, a task force appointed by the Western District of the Institute of Transportation Engineers. The Western District oversees the thirteen Western states, including California. Within California, the Institute of Transportation Engineers is represented by seven sections throughout the state. The Officers representing the seven California ITE Sections have supported the task force in preparing this letter and their names and contact information are shown below. In addition to the officers listed below, ITE would like to recognize the following members who contributed to the information provided in this letter:

Walter Okitsu, KOA Corporation
Bob Kahn, RK Engineering Group
Steve Colman
Jim Jeffery
Tony Petros. LSA Associates
Sandipan Bhattacharjee, Translutions
Mike Calandra, San Diego Association of Governments

Future correspondence should be directed to Erik Ruehr, Chair of the California SB 743 Task Force, who can represent the California ITE Section Presidents for correspondence purposes. Contact information is shown below:

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Thank you again for the opportunity to be involved in this discussion. We look forward to working with you in the months ahead.

Respectfully yours,

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California SB 743 Task Force

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TranSync

Signal Timing Management, Optimization, Diagnosis, and Evaluation

Zong Z. Tian, Ph.D., P.E.

Center for Advanced Transportation Education and Research (CATER)
University of Nevada, Reno

http://unr.edu/homepage/zongt/

Outline

- Overview of TranSync-D and TranSync-M
- Demo of TranSync features
- Case studies
- Q&A

3

Critical Aspects of Signal Timing

- **Management** – how to easily store, access, and view signal timing data
- **Development** – how to develop truly optimized signal timing plans
- **Implementation** – how to implement, diagnose, and fine-tune timing plans in the field
- **Evaluation** – how to assess the performance and quality of signal timing plans

4

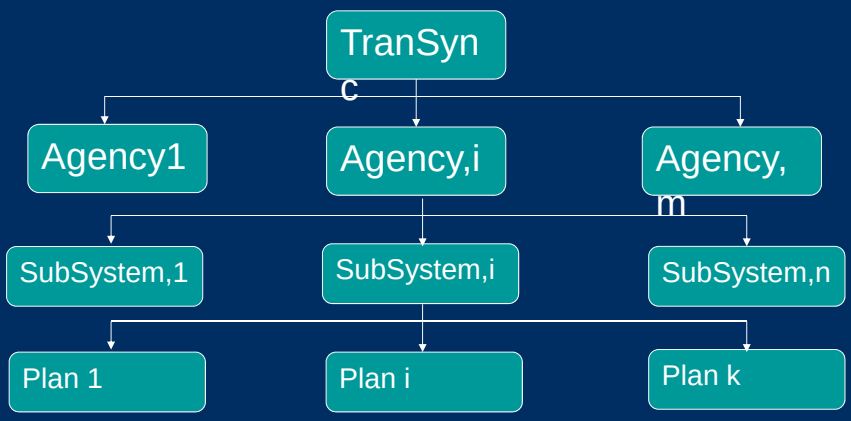
TranSync

- **TranSync-D – Management and Optimization**
  - Multiple agency, multiple timing plans
  - Bandwidth-based optimization (volume and geometry are not needed)
  - Partition technique for long arterials
  - Variable speeds for optimization and performance
  - Performance measure reports
- **TranSync-M – Diagnostic and Evaluation**
  - Field diagnostic of common signal issues, such as early return, transition
  - Virtual signal display
  - GPS travel recording and timing verification

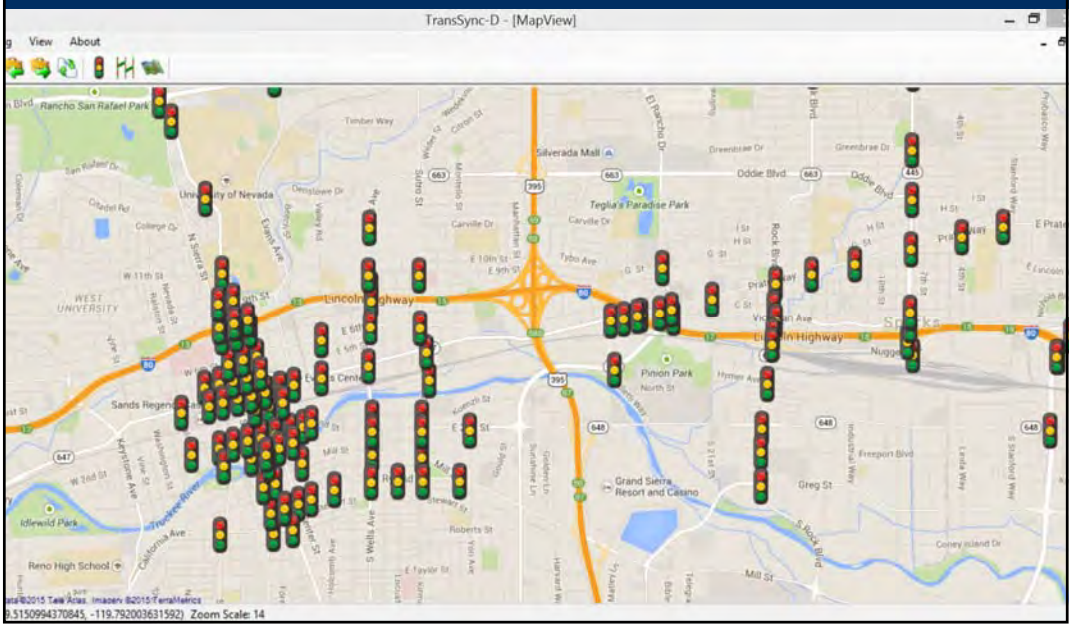
TranSync-D Features

- Multiple agency and multiple timing plans in one single database
- Creating the database: manual and Synchro import
- Subsystem (arterial) management
- Manual time-space diagram manipulation
- Optimization with partition for large arterials
- Performance visualization – GPS track and video
- Quality of signal timing performance index

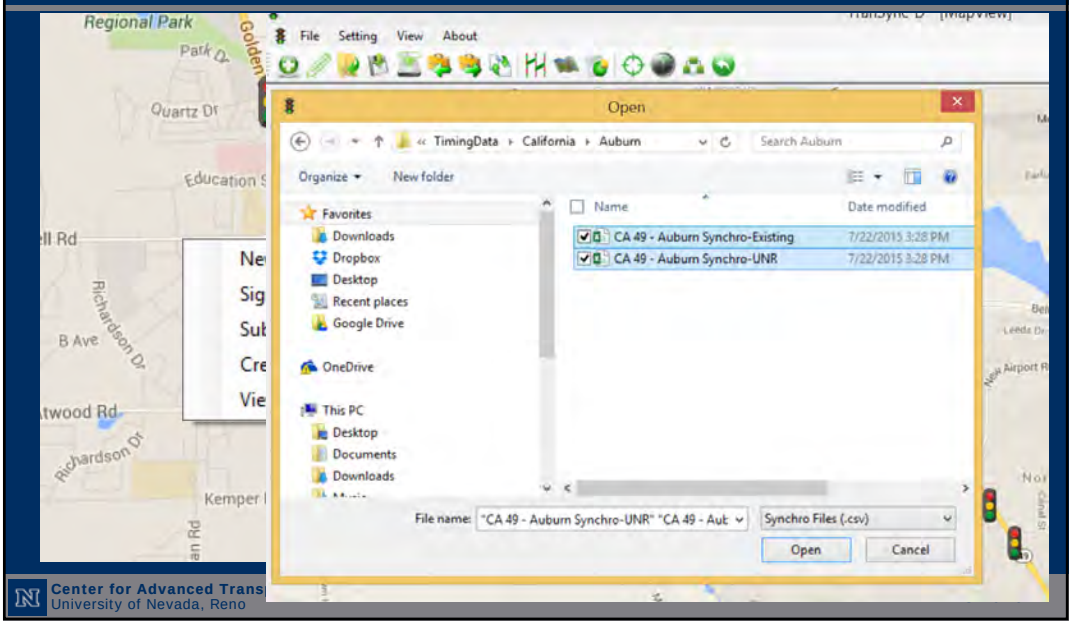
Database for Multiple Agencies, Multiple Time Periods



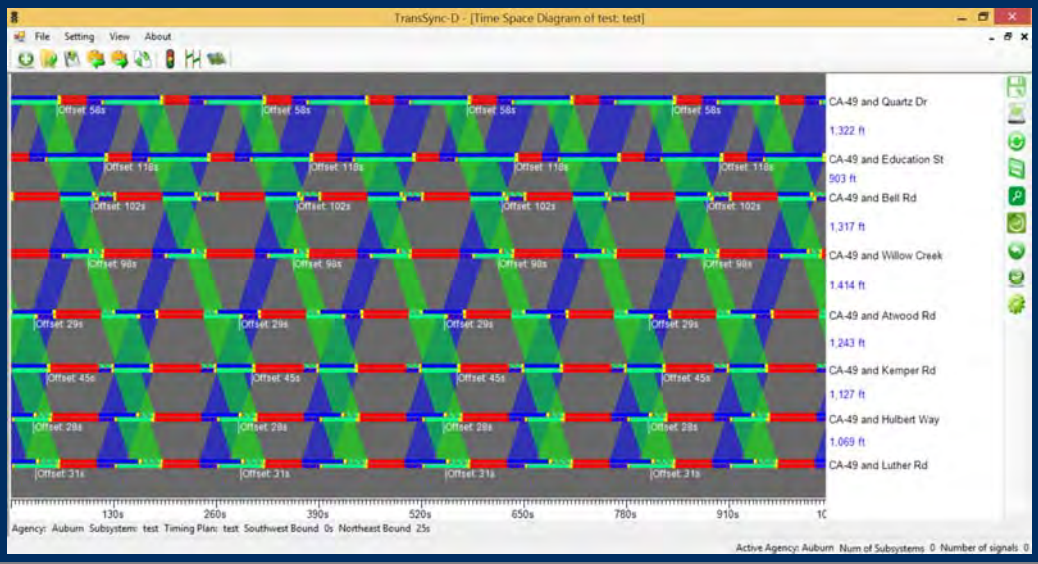
Database for Multiple Agencies, Multiple Time Periods



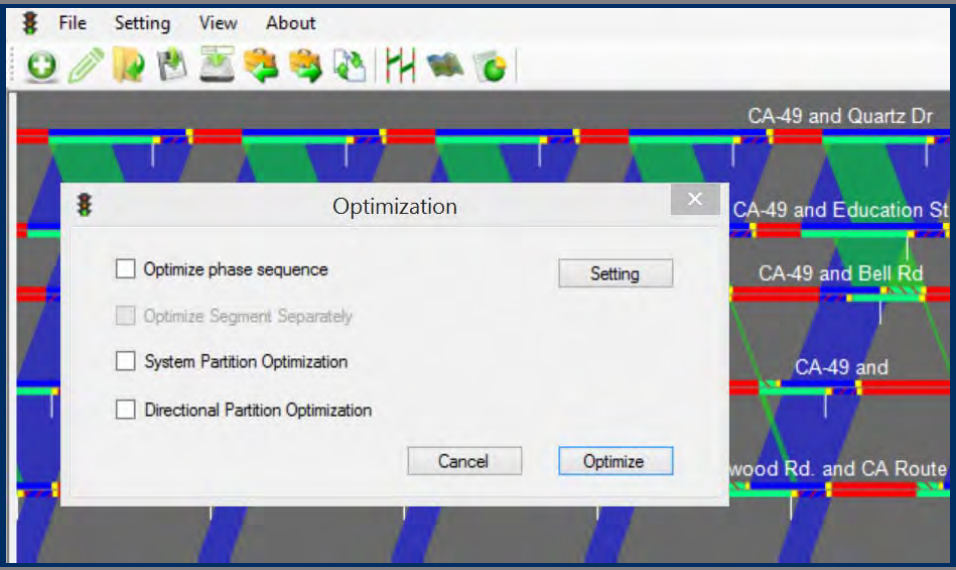
Generating the Database - Manual and Import



Subsystem and Time-space Diagram



Optimization



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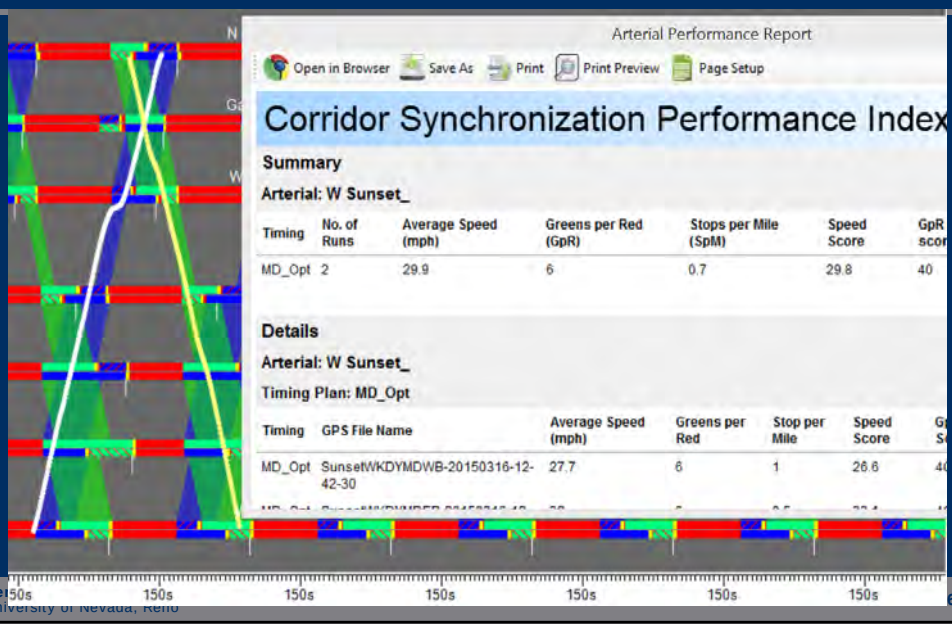
Performance Measures



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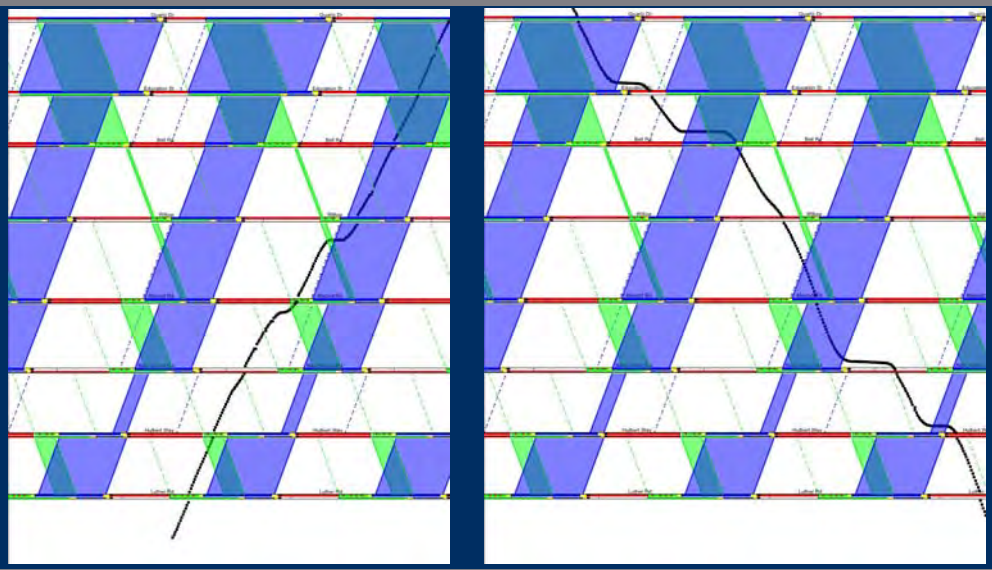
Case Demo – CA 49, Auburn

Before Timing



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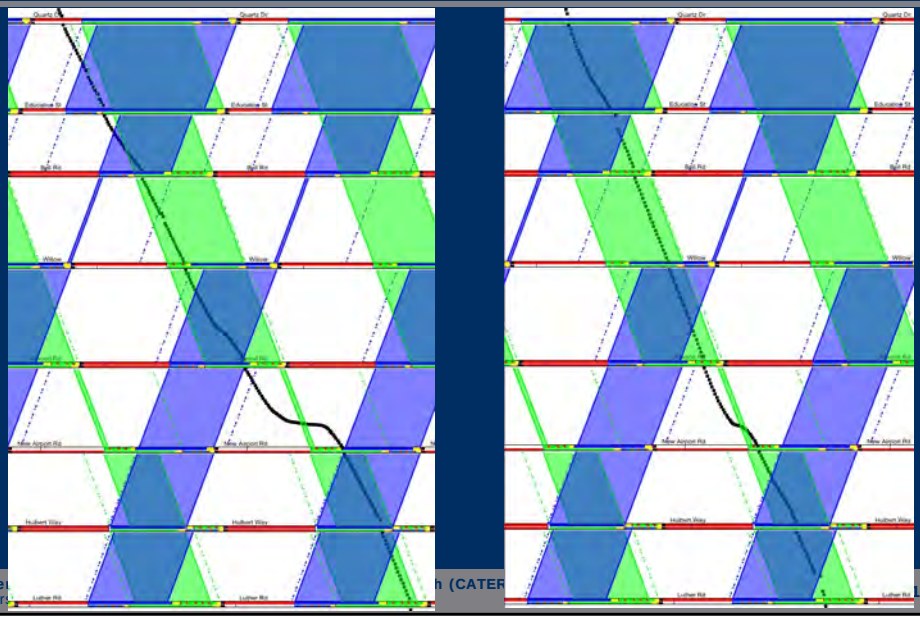
Case Demo – CA 49, Auburn

After Timing



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Case Demo – CA 49

Before

After

Program for Arterial System Synchronization (PASS) FY 15/16 Cycle - Project Status Update (As of 5/3/2016)

#	County	Project Sponsor	Project Corridor (# of signals)	# of Signals	GPS Clocks	Project Services and Plans	Consultant	Project Status*
1	Alameda	Fremont	Fremont Blvd (8), Mowry Ave (8), Stevenson Blvd (8)	24	0	Weekday (AM/MD/School/PM) (24); Weekend (One peak period) (24)	Iteris	4A
2	Alameda	Hayward	Tennyson Rd (13)	13	6	Weekday (AM/MD/PM) (13)	Iteris	4
4	Alameda	San Leandro	San Leandro Blvd (7)	7	1	Weekday (AM/MD/PM) (7); Weekend (three peak periods) (7)	Iteris	4
3	Alameda	Oakland	40th St (8), Harrison St (15), Jackson St (10), MacArthur Blvd (10)	43	40	Weekday (AM/MD/PM) (43); Weekend (two peak periods) (43)	KHA	4
6	Contra Costa	Oakley	Main St (5)	5	5	Weekday (AM/MD/PM) (5); Weekday (Two school Peaks) (5)	TJKM	4A
5	Napa	Napa	Hwy 121 (12), Redwood Rd/ Trancas St (9), Soscol Ave (5)	26	17	Weekday (AM/MD/PM) (14); Weekend (two peak periods) (14); Data Collection Only (12)	TJKM	4
8	San Mateo	South SF	Hickey Blvd (5), Gateway Blvd (5)	10	8	Weekday (AM/MD/PM) (10); Weekend (two peak periods) (10); Weekday (One school Peak) (5)	TJKM	4A
7	Santa Clara	Sunnyvale	Java Dr (5), Mathilda Ave/ Sunnyvale Saratoga Rd (24), Maude Ave (4), Tasman Dr (4)	37	0	Weekday (AM/MD/PM) (37); Weekend (two peak periods) (17)	DKS	3B
			Total	**165**	**77**			

** 1B = Final Scope, Schedule and Budget; 2A = Draft Existing Conditions Report; 2B = Final Existing Conditions Report; 3A = Draft Recommendations Report; 3B =Revised Recommendations Report; 4 = Preliminary Implementation and Fine-tuning; 4A = Draft Project Report with Benefit Cost Analysis; 4B = Final Project Report with Benefit Cost Analysis*

FHWA Fact Sheet

Fixing America's Surface Transportation Act (FAST Act)

ADVANCED TRANSPORTATION AND CONGESTION MANAGEMENT TECHNOLOGIES DEPLOYMENT (FAST Act SECTION 6004)

Fiscal year	2016	2017	2018	2019	2020
Authorization	$60 M	$60 M	$60 M	$60 M	$60 M

Program purpose

The FAST Act established the Advanced Transportation and Congestion Management Technologies Deployment Program to make competitive grants for the development of model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment.

Statutory citations

FAST Act § 6004; 23 U.S.C. 503(c)(4)

Funding features

Type of budget authority

Contract authority from the Highway Account of the Highway Trust Fund. Funds are available until expended. Funds are subject to the overall Federal-aid obligation limitation and the obligation limitation associated with these funds is available for four fiscal years.

Source of funding

The FAST Act funds the program through a set-aside from the Highway Research and Development, Technology and Innovation Deployment, and Intelligent Transportation System Research Programs.

Set-aside for reporting, evaluation, and administrative costs

The Secretary of Transportation may set aside $2 million each fiscal year for reporting, evaluations, and administrative costs of the program. [23 U.S.C. 503(c)(4)(I)]

Federal share

Up to 50% of the cost of the project

Eligible activities

Grant recipients may use funds under this program to deploy advanced transportation and congestion management technologies, including—

- advanced traveler information systems;
- advanced transportation management technologies;

- infrastructure maintenance, monitoring, and condition assessment;
- advanced public transportation systems;
- transportation system performance data collection, analysis, and dissemination systems;
- advanced safety systems, including vehicle-to-vehicle and vehicle-to-infrastructure communications;
- technologies associated with autonomous vehicles, and other collision avoidance technologies, including systems using cellular technology;
- integration of intelligent transportation systems with the Smart Grid and other energy distribution and charging systems;
- electronic pricing and payment systems; or
- advanced mobility and access technologies, such as dynamic ridesharing and information systems to support human services for elderly and disabled individuals. [23.U.S.C. 503(c)(4)(E)]

A grant recipient may use up to 5% of the funds awarded each fiscal year to carry out planning and reporting requirements under the program. [23 U.S.C. 503(c)(4)(L)]

Eligible applicants

- State or local government or political subdivision thereof,
- Transit agency,
- Metropolitan planning organization (MPO) representing a population of more than 200,000,
- Multijurisdictional group made up of the above eligible applicants, with a signed agreement to implement the initiative across jurisdictional boundaries, and
- Consortium of research or academic institutions. [23 U.S.C. 503(c)(4)(N)]

Program features

Project selection

The FAST Act requires the Secretary to develop criteria for selection of an eligible entity to receive a grant, including how the proposed deployment of technology will—

- reduce costs and improve return on investments, including through the enhanced use of existing transportation capacity;
- deliver environmental benefits that alleviate congestion and streamline traffic flow;
- measure and improve the operational performance of the applicable transportation network;
- reduce the number and severity of traffic crashes and increase driver, passenger, and pedestrian safety;
- collect, disseminate, and use real-time traffic, transit, parking, and other transportation-related information to improve mobility, reduce congestion, and provide for more efficient and accessible transportation;

- monitor transportation assets to improve infrastructure management, reduce maintenance costs, prioritize investment decisions, and ensure a state of good repair;
- deliver economic benefits by reducing delays, improving system performance, and providing for the efficient and reliable movement of goods and services; or
- accelerate the deployment of vehicle-to-vehicle, vehicle-to-infrastructure, autonomous vehicles, and other technologies. [23 U.S.C. 503(c)(4)(B)]

The FAST Act requires the Secretary to request applications each fiscal year and to award grants to at least 5 and not more than 10 eligible entities, and further requires that the awards be diverse in both the technologies to be deployed and geographically. [23 U.S.C. 503(c)(4)(D)]

The Secretary may not award more than 20% of program funding for a fiscal year to a single grant recipient.

Reporting requirements

The FAST Act requires each grant recipient to report annually to the Secretary on the costs and benefits of the project and how the project has met the expectations described in the recipient's application.

Beginning 3 years after the first grant award, and annually thereafter, the Secretary will post on the DOT web site a report on the effectiveness of the grant recipients in meeting their projected deployment plans.

February 2016

NextGen Arterial Operations Program Project Status (as of 5/3/2016)

#	Key Deliverable	NextGen AOP Projects			
		AC Transit	**LAVTA/ Dublin**	**City of Fremont**	**County of Santa Clara**
1	1a. Draft SEMP	Completed	Completed	Completed	n/a
	1b. Final SEMP	Completed	Completed	Completed	n/a
2	2a. Draft User Needs Report	Completed	Completed	Completed	Completed
	2b. Final User Needs Report	Completed	Completed	Completed	Completed
3	3a. Draft ConOps	Completed	Completed	Completed	n/a
	3b. Final ConOps	Completed	Completed	Completed	n/a
4	4a. Draft System Requirements	Completed	Completed	Completed	Completed
	4b. Final System Requirements	Completed	Completed	Completed	Completed
5	5a. Draft Verification Plan	Completed	Completed	Completed	Completed
	5b. Final Verification Plan	Completed	Completed	Completed	Completed
6	6a. Draft Procurement Document	***Ongoing***	Completed	Completed	n/a
	6b. Final Procurement Document	*	Completed	Completed	n/a
7	7. Vendor Selection	*	***Ongoing***	Completed	n/a
8	8. System Deployment	*	*	***Ongoing***	***Ongoing***
9	9. System Acceptance	*	*	*	*
10	10. Project Evaluation	*	*	*	*

*Note: * Deliverables/tasks to be completed later.*

METROPOLITAN
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COMMISSION

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Memorandum

TO: Arterial Operations Committee (AOC) DATE: May 3, 2016

FR: Virginia Lingham, MTC

RE: Connected Vehicle Program Update

Vehicle to Infrastructure (V2I) Deployment Coalition

Connected Vehicle (CV) technologies are defined by USDOT as follows:

> *"Connected vehicle research is a multimodal initiative that aims to enable safe, interoperable networked wireless communications among vehicles, the infrastructure, and passengers' personal communications devices."*

The term Vehicle to Infrastructure (V2I) refers to a wireless exchange of data between vehicles and roadway infrastructure. This exchange of data is typically bi-directional, allowing data from the roadside to be delivered to the vehicle, and data from the vehicle to be delivered to the roadside.

What is the V2I Deployment Coalition?

Nationwide deployment, operations, and maintenance of V2I applications will require long-term cooperation, partnership, and interdependence between the infrastructure owners and operators (state, county, and local level transportation agencies); the automobile industry original equipment manufacturers (OEMs); aftermarket manufacturers; and a variety of other stakeholders. For these reasons, with USDOT support, AASHTO, ITE and ITS America have established the V2I DC as a coalition for CV and infrastructure-related deployments.

The **vision** of the V2I Deployment Coalition is defined as:

> *An integrated national infrastructure that provides the country a connected, safe and secure transportation system taking full advantage of the progress being made in the Connected and Autonomous Vehicle arenas.*

The **mission** of the V2I Deployment Coalition is to:

> *To work collaboratively with the industry, state and local governments, academia and USDOT to achieve the goal of deploying and operating a functioning V2I infrastructure.*

The **objectives** of the V2I Deployment Coalition are to:

- *Provide leadership on Connected Vehicle Program deployment efforts*
- *Establish CV deployment strategies*
- *Lead and provide support on continued technical research for CV*
- *Support CV standards development*
- *Provide input to and refinement of CV guidance*

The V2I DC has established initial goals as follows:

Goal #1: Help accelerate the deployment of V2I technologies at *intersections* where the majority of crashes and/or congestion occur;
Goal #2: Help accelerate the deployment of V2I technologies to support *end of queue warnings* in locations with high rates of rear-end collisions;
Goal #3: Help accelerate the deployment of V2I technologies for *work zone management*; and
Goal #4: Help accelerate the deployment of V2I technologies for c*urve warning systems*.

The V2I Deployment Coalition technical work is accomplished through five Technical Working Groups, identified below:

1) **Deployment Initiatives** - Sharing information and discussing current and previous V2I implementation initiatives.
2) **Deployment Research** - Providing insight into what further research, analysis, and planning studies are needed to be undertaken to guide the states and others as they proceed toward implementation.
3) **Infrastructure Operator, OEM, and Supplier Partnerships** - Identifying cross-cutting issues related to infrastructure operators, OEMs and suppliers, and discuss possible approaches towards resolving them
4) **Deployment Guidance** - Assessing the stakeholder impact of the USDOT Deployment Guidance, and providing input
5) **Deployment Standards** - Identifying and discussing applicable standards, the state of practice in standards development and deployment, and the expectations for future standards

The information included above, and more information about the V2I Deployment Coalition is available at http://www.transportationops.org/V2I/V2I-overview.

V2I Deployment Coalition Spring 2016 Workshop and Demonstrations

The V2I Deployment Coalition met on April 19-21, 2016 in Detroit, MI for an in-person meeting to coordinate among and between the Technical Working Groups as well as to share information about the accomplishments of the Coalition to date. A full summary of progress through March 1, 2016 is posted on the V2I Deployment Coalition website at http://www.transportationops.org/V2I/about.

New outreach material on CV from USDOT's Joint Programs Office was shared at the meeting. The attached outreach materials may be of interest to members of the Arterial Operations Committee:

- What Public Officials Need to Know about Connected Vehicles
- How Connected Vehicles Work
- Dedicated Short Range Communications (DSRC): The Future of Safer Driving

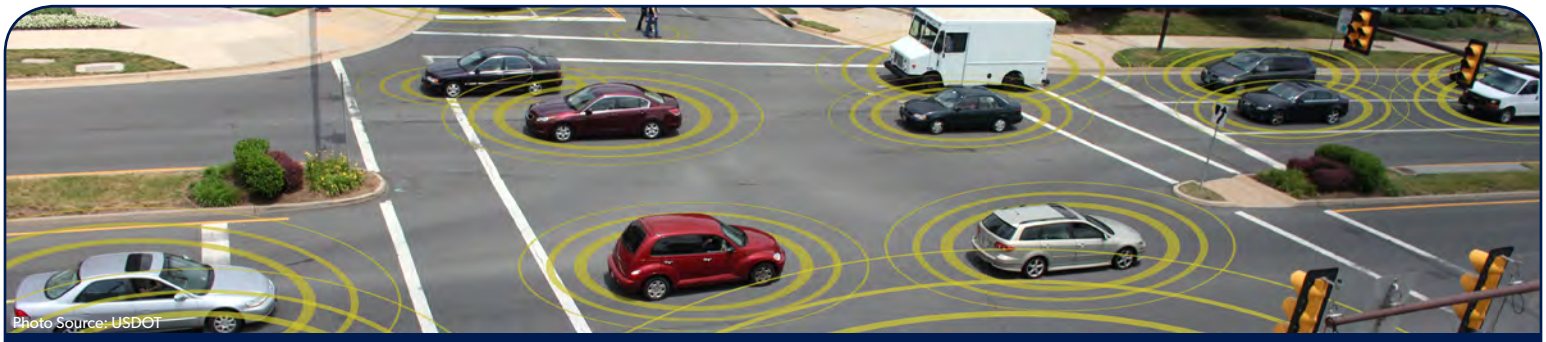
Also part of the workshop was a demonstration of V2I applications at the Crash Avoidance Metrics Partnership (CAMP) Proving Grounds. CAMP is a partnership of automotive manufacturers that has been working with USDOT since 2006 on various CV initiatives. CAMP demonstrated included the following applications (see attached for more information):

- Reduced Speed Zone Warming/ Lane Closure Warning
- Basic Information Message
- Red Light Violation Warning
- Curve Speed Warning (Car and Truck)

Connected Vehicle Projects within the Bay Area

Please contact Virginia Lingham at vlingham@mtc.ca.gov to add your project, make edits to this list, or with any questions.

Project Name	Leading Agency	Status	V2V	V2I	V2X	Self-Driving
Carma I-Beacon	CCTA	Complete		YES		
Enlighten Mobile Application	City of Walnut Creek	Complete			YES	
Connected Car Hackathon	MTC	Complete			YES	
MMITSS - CA Demonstration	UCB PATH	Complete		YES	YES	
Smart Bus Stop	VTA	Complete		YES	YES	
I-80 Connected Corridor ICM	Caltrans	In-Progress		YES	YES	
Google Self-Driving Car	Google	In-Progress	YES		YES	YES
San Jose Transportation Innovation Zone	San Jose	In-Progress		YES	YES	
Mobile Eye Pilot	VTA	In-Progress		YES		
VTA Flex On-Demand Dynamic Transit Operations	VTA	In-Progress		YES	YES	
Bishop Ranch Autonomous Vehicle Operations	CCTA	Planning		YES	YES	YES
GoMentum Station	CCTA	Planning	YES			YES
I-680 High Tech Corridor	CCTA	Planning		YES		
TriDelta Integrated Dynamic Transit Operations	CCTA	Planning		YES	YES	
FRATIS and ITS Improvements at Port of Oakland	MTC	Planning	YES	YES	YES	
MMITSS-based Transit Signal Priority Evaluation	MTC	Planning		YES		
San Jose Innovative Streetlight Replacement	San Jose	Planning		YES	YES	
San Francisco Smart City Challenge	SFMTA	Planning	YES	YES	YES	YES
Beacon Based Rewards App & Fare Payment	VTA	Planning		YES	YES	
Swift Mile Electric Bikes	VTA	Planning			YES	
VTA Central App	VTA	Planning			YES	



WHAT PUBLIC OFFICIALS NEED TO KNOW ABOUT CONNECTED VEHICLES

Connected vehicles have the potential to transform the way Americans travel through the creation of a safe, interoperable wireless communications network—a system that includes cars, buses, trucks, trains, traffic signals, cell phones, and other devices. In the past, the U.S. Department of Transportation (USDOT) has focused on helping people survive crashes. Connected vehicle technology will change that paradigm by giving people the tools to avoid crashes. Connected vehicles can help drivers anticipate potential crashes and significantly reduce the number of lives lost each year.

What Are Connected Vehicles and How Do They Work

Connected vehicle technology can change our transportation system as we know it by enabling safe, interoperable networked wireless communications among vehicles, the infrastructure, and passengers' personal communications devices. Connected vehicle technology will enable cars, trucks, buses, and other vehicles to "talk" to each other with in-vehicle or aftermarket devices that continuously share important safety and mobility information. Connected vehicles can also use wireless communication to "talk" to traffic signals, work zones, toll booths, school zones, and other types of infrastructure.

Connected vehicle applications provide connectivity between and among vehicles, infrastructure, and wireless devices to:

- Enable crash prevention
- Enable safety, mobility and environmental benefits
- Provide continuous real-time connectivity to all system users

Motor vehicle crashes were the leading cause of death for age 4 and every age 11 through 27, according to the Centers for Disease Control.

Agencies involved in connected vehicle research:

- Federal Highway Administration (FHWA)
- Federal Motor Carrier Safety Administration (FMCSA)
- Federal Railroad Administration (FRA)
- Federal Transit Administration (FTA)
- Maritime Administration (MARAD)
- National Highway Traffic Safety Administration (NHTSA)
- Office of the Assistant Secretary for Research and Technology

U.S. Department of Transportation


Photo Source: USDOT

Safety-related systems for connected vehicle technology will likely be based on dedicated short-range communications (DSRC), a technology similar to Wi-Fi. DSRC is fast, secure, reliable, and not vulnerable to interference. Non-safety applications may be based on different types of wireless technology. The vehicle information communicated does not identify the driver or vehicle, and technical controls have been put in place to help prevent vehicle tracking and tampering with the system.

The vision for connected vehicle technologies is to transform surface transportation systems to create a future where:

- Highway crashes and their tragic consequences are significantly reduced
- Traffic managers have data to accurately assess transportation system performance and actively manage the system in real time, for optimal performance
- Travelers have continual access to accurate travel time information about mode choice and route options, and the potential environmental impacts of their choices
- Vehicles can talk to traffic signals to eliminate unnecessary stops and help drivers operate vehicles for optimal fuel efficiency.

Like the Internet, which provides information connectivity, connected vehicle technology provides a starting point for transportation connectivity that will potentially enable countless applications and spawn new industries.


Photo Source: USDOT

Connected Vehicles Can Dramatically Reduce Crashes in Your Community

According to the National Highway Traffic Safety Administration (NHTSA), there were 5.6 million crashes and 2.36 million injuries in 2012. The number of fatalities from vehicle crashes is falling but still accounted for 33,561 deaths in 2012. A recent NHTSA report found that wireless vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications has the potential to address crash scenarios involving non-impaired drivers. In part, this is because connected vehicles feature safety warnings that alert drivers of potentially dangerous situations—impending collisions, icy roads, and dangerous curves—before the driver is aware of them.

By exchanging anonymous, vehicle-based data regarding position, speed, and location (at a minimum), V2V communications enables a vehicle to sense threats and hazards with a 360-degree awareness of the position of other vehicles and the threat or hazard they present; calculate risk; issue driver advisories or warnings; or take pre-emptive actions to avoid and mitigate crashes. Pivotal work is being conducted to guarantee that these driver warnings will not be a distraction and that people will only be made aware when they are approaching danger.

Connected Vehicles Can Make Your Communities Safer

Through V2I communications, connected vehicles can wirelessly exchange critical safety and operational data between vehicles and highway infrastructure to avoid or mitigate motor vehicle crashes, as well as enable a wide range of other safety, mobility, and environmental benefits that will help to make our roads and communities safer. V2I communications apply to all vehicle types and all roads and transform infrastructure equipment into “smart infrastructure” that can recognize high-risk situations in advance, resulting in driver alerts and warnings through specific countermeasures. By communicating with roadside infrastructure, connected vehicles can alert drivers when they are entering a school zone, if workers are on the side of the road, and if an upcoming traffic light is about to change. V2I communications have the potential to resolve an additional 12 percent of crash types not addressed under V2V communications.

Connected Vehicles Can Make It Easier to Travel in Your Community

According to the Texas Transportation Institute, U.S. highway users wasted 5.5 billion hours stuck in traffic in 2011—nearly one full work week (or vacation week) for every traveler. While the primary goal is safety, connected vehicle communications are also significant in improving mobility and environment by reducing delays and congestion caused by crashes, enabling wireless roadside inspections, or helping commercial vehicle drivers identify safe areas for parking.

Connected vehicles transmit anonymous signals that will help generate new data about how, when, and where vehicles travel—information that transportation managers will then analyze to help make roads safer and less congested. The same signals could also be shared among mobile devices and roadside sensors. Connected vehicles also include buses, trains, and other forms of public transit. So, by providing real-time information, travelers will have a realistic idea of when transit vehicles will arrive. They will also be able to improve bus and train connections, and this will help make public transportation more appealing to the average traveler.

Connected Vehicles Can Make Your Communities More Livable

One of the principles of livability is to provide more transportation choices to decrease household transportation costs, reduce our dependence on oil, improve air quality, and promote public health. Connected vehicles can help to make our communities more livable by providing a new data-rich environment that will spawn a multitude of new applications to keep traffic flowing and make it easier for people to plan their travel experience. Imagine, for instance, applications that can help you find open parking spaces, locate available taxis, guarantee you make your bus or train connection, or help a blind pedestrian cross the street. Connected vehicles can also support livability by providing pedestrians with additional information about road and sidewalk conditions before they leave home; giving public buses priority when they approach red lights so that transit travelers are less likely to be stuck in traffic; helping travelers choose the greenest transportation route and minimize the amount of time they are in their cars; and allowing local communities to set up comprehensive wireless-based transportation management centers that will help them much better manager an interconnected network that includes all local modes of transportation.

Connected Vehicles Can Help Curb Local Pollution

According to the Texas Transportation Institute, the total amount of wasted fuel topped 2.9 billion gallons in 2011. In addition, the transportation sector contributes 27 percent of the country's greenhouse gas (GHG) emissions, according to the Environmental Protection Agency's Inventory of U.S. Greenhouse Gas Emissions and Sinks. Connected vehicle technologies will generate real-time data that drivers and transportation managers can use to make green transportation choices.

One example is how real-time information about traffic conditions will help motorists eliminate unnecessary stops and let their vehicles reach optimal fuel-efficiency. Informed travelers may also be able to avoid congestion by taking alternate routes or public transit, or rescheduling their trip—any of which can make their trip more eco-friendly.
Data generated from connected vehicle systems can also provide operators with detailed, real-time information on vehicle location, speed, and other operating conditions. This information can be used to improve system operation. On-board equipment may also advise vehicle owners on how to optimize the vehicle's operation and maintenance for maximum fuel efficiency.


Photo Source: USDOT

Connected Vehicles Are Closer Than You Think

The reality of a nationwide network of connected vehicles is closer than once thought possible. BThe reality of a nationwide network of connected vehicles is closer than once thought possible. The USDOT's Connected Vehicle Safety Pilot Program proved that such a system of vehicles communicating can indeed work in the real world and in a variety of vehicle types including cars, trucks, transit vehicles, motorcycles, and even bicycles—and can provide significant safety benefits. The Safety Pilot Model Deployment was the largest real-world test of connected vehicle technology to date, with over 2,700 participating vehicles using wireless safety technology to help everyday drivers avoid crashes as they traveled along their normal routines.

Based on the results of the safety pilot and other research and due to the substantial impact that the technology could have on safety, NHTSA announced in February 2014 that it will begin taking steps to enable V2V communications technology for light vehicles.

In August 2014, NHTSA released an advance notice of proposed rulemaking (ANPRM) and a supporting comprehensive research report on V2V communications technology. The report includes analysis of the Department's research findings in key areas such as technical feasibility, privacy, and security, as well as preliminary estimates on costs and safety benefits.

The preliminary estimates of the safety benefits of V2V technology show two safety applications—left turn assist (LTA) and intersection movement assist (IMA)—could prevent up to 592,000 crashes and save up to 1,083 lives per year. LTA warns drivers not to turn left in front of another vehicle traveling in the opposite direction, and IMA warns them if it is not safe to enter an intersection due to a high probability of colliding with one or more vehicles. Additional applications could also help drivers avoid imminent danger through forward collision, blind spot, do not pass, and stop light/stop sign warnings.

NHTSA plans to issue the proposal on V2V safety messaging by 2016.

The U.S. Government's Role

USDOT's Intelligent Transportation Systems Joint Program Office fosters the development and future deployment of these connected vehicle technologies. But connected vehicle research involves several agencies within the USDOT, including NHTSA, the Federal Highway Administration, the Federal Motor Carrier Safety Administration, the Federal Transit Administration, and the Federal Railroad Administration.

The USDOT and its public and private partners are working to address the technical, safety, and policy challenges and are helping to create the standards and the wireless architecture that will be the backbone of the system.

Connected vehicle research will leverage the potentially transformative capabilities of wireless technology to make surface transportation safer, smarter, and greener. If successful, connected vehicles will ultimately enhance the mobility and quality of life of all Americans, while helping to reduce the environmental impact of surface transportation.


Photo Source: USDOT

U.S. Department of Transportation

For more information about this initiative, please contact:
Mike Pina, Program Manager, Communications and Outreach
ITS Joint Program Office | (202) 366-3700 | mike.pina@dot.gov | www.its.dot.gov

FHWA-JPO-12-003

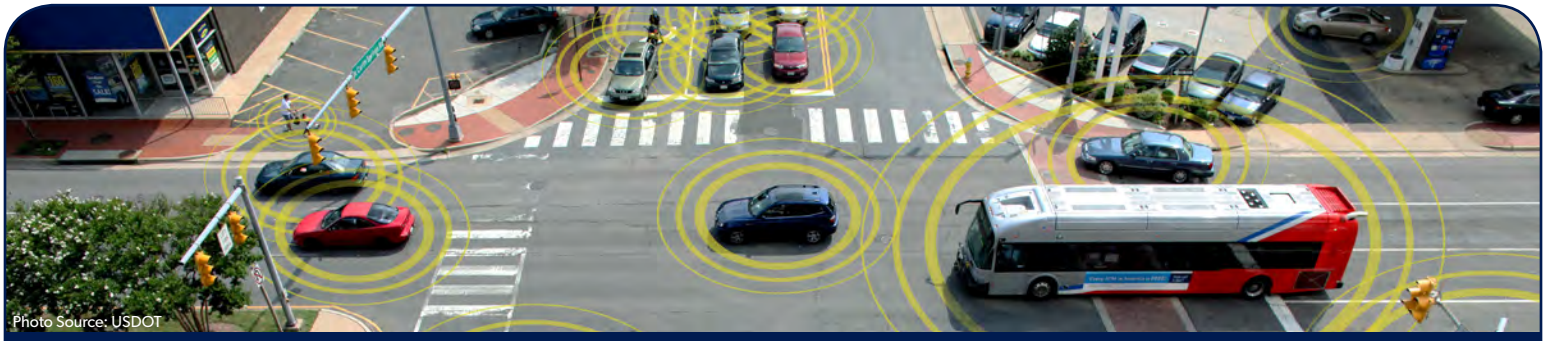


Photo Source: USDOT

HOW CONNECTED VEHICLES WORK

Connected vehicles have the potential to transform the way Americans travel through the creation of a safe, interoperable wireless communications network—a system that includes cars, buses, trucks, trains, traffic signals, smart phones, and other devices. In the past, the U.S. Department of Transportation (USDOT) has focused on helping people survive crashes. Connected vehicle technology will change that paradigm by giving people the tools to *avoid* crashes.

Why Connected Vehicle Technologies Are Needed

Connected vehicle technologies aim to tackle some of the biggest challenges in the surface transportation industry—in the areas of safety, mobility, and environment.

- **Safety:** According to the National Highway Traffic Safety Administration (NHTSA), there were 5.6 million crashes in 2013. The number of fatalities from vehicle crashes is falling but still accounted for 32,719 deaths. Connected vehicle technologies will give all drivers the tools they need to anticipate potential crashes and significantly reduce the number of lives lost each year.
- **Mobility:** According to the Texas Transportation Institute, U.S. highway users wasted 6.9 billion hours stuck in traffic in 2014. Connected vehicle mobility applications will enable system users and system operators to make smart choices that reduce travel delay.
- **Environment:** According to the Texas Transportation Institute, the total amount of wasted fuel topped 3.1 billion gallons in 2014. Connected vehicle environmental applications will give motorists the real time information they need to make "green" transportation choices.

Connected vehicles feature safety warnings that alert drivers of potentially dangerous conditions — impending collisions, icy roads and dangerous curves — before the driver is aware of them. The technology is expected to reduce unimpaired vehicle crashes by 80 percent.

Connected vehicle applications provide connectivity between and among vehicles, infrastructure, and wireless devices to:

- Enable crash prevention
- Enable safety, mobility and environmental benefits
- Provide continuous real-time connectivity to all system users

Motor vehicle crashes are the leading cause of death for people ages 4, 11 through 27, according to the Centers for Disease Control.

Agencies involved in connected vehicle research:

- Federal Highway Administration (FHWA)
- Federal Motor Carrier Safety Administration (FMCSA)
- Federal Railroad Administration (FRA)
- Federal Transit Administration (FTA)
- National Highway Traffic Safety Administration (NHTSA)
- Office of the Assistant Secretary for Research and Technology

U.S. Department of Transportation

How Connected Vehicles Will Work

With connected vehicle technology, drivers will get warning messages in their vehicles when a potential crash is imminent.

Safety-related systems for connected vehicle technology will likely be based on dedicated short-range communications (DSRC), a technology similar to WiFi. DSRC is fast, secure, and reliable. Non-safety applications may be based on different types of wireless technology. Cars, trucks, buses, and other vehicles will be able to "talk" to each other with in-vehicle or aftermarket devices that continuously share important safety and mobility information with each other. Connected vehicles can also use wireless communication to "talk" to traffic signals, work zones, toll booths, school zones, and other types of infrastructure. The vehicle information communicated does not identify the driver or vehicle, and technical controls have been put in place to help prevent vehicle tracking and tampering with the system.

How Connected Vehicles Will Improve Safety

Connected vehicle safety applications will enable drivers to have 360-degree awareness of hazards and situations they cannot even see. Through in-car warnings, drivers will be alerted to imminent crash situations, such as merging trucks, cars in the driver's blind side, or when a vehicle ahead brakes suddenly. By communicating with roadside infrastructure, drivers will be alerted when they are entering a school zone, if workers are on the roadside, and if an upcoming traffic light is about to change.

Pivotal work is being conducted to guarantee that these driver warnings will not be a distraction and that people will only be made aware when they are approaching danger.

The connected vehicle system will be similar in many ways to other wireless networks and will create a dynamic transportation network based on an open platform to allow for new and creative applications. Open standards allow anyone to develop new products and applications that will work in this space.

How Connected Vehicles Will Keep People Moving

Private signals in vehicles will help generate new data about how, when, and where vehicles travel—information that will then be analyzed by transportation managers to help make roads safer and less congested.

The same signals could also be shared among mobile devices and roadside sensors. This exciting new data-rich environment will also be the genesis for a multitude of new mobility applications that will help to keep traffic flowing and make it easier for people to plan their travel experience. Imagine, for instance, apps that can help you find open parking spaces, locate available last-minute ride-share partners, guarantee you make your bus or train connection, or help a blind pedestrian cross the street. With an open source system for mobility applications, there will be minimal restrictions and limitless opportunities.

How Connected Vehicles Will Improve The Environment

Mitigating greenhouse gas (GHG) contributions is everyone's responsibility. In 2013, the transportation sector contributed 27 percent of the country's GHG emissions, according to the Environmental Protection Agency's Inventory of U.S. Greenhouse Gas Emissions and Sinks. Connected vehicle technologies will generate real-time data that drivers and transportation managers can use to make green transportation choices.

For example, real-time information about traffic conditions will help motorists eliminate unnecessary stops and vehicles reach optimal fuel-efficiency. Informed travelers may also be able to avoid congestion by taking alternate routes or public transit, or rescheduling their trip—any of which can make their trip more eco-friendly. By providing real-time information, travelers will have a realistic idea of when transit vehicles will arrive; they will also be able to improve bus and train connections, and this will help make public transportation more appealing to the average traveler.

The U.S. Government's Role

The USDOT's Intelligent Transportation Systems (ITS) Joint Program Office fosters the development and future deployment of connected vehicle technologies. But connected vehicle research involves all agencies within the USDOT including NHTSA, the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration, the Federal Transit Administration, and the Federal Railroad Administration, as well as several leading auto manufacturers and academic research institutions.

In August of 2014, NHTSA announced that it would begin taking steps to enable vehicle-to-vehicle (V2V) communication technology for light vehicles and is now working on a regulatory rulemaking that will require its installation in all new light vehicles in the coming years. In May 2015, Secretary Foxx announced the USDOT would accelerate the deployment of connected vehicles. NHTSA will move ahead of its timetable for the proposed V2V rule. The proposal is expected in 2016. In 2015, the FHWA will release a vehicle-to-infrastructure (V2I) guidance document to assist transportation managers and operators interested in adapting their traffic signals and other roadside devices so they are compatible with the new connected vehicles.

For more information about this initiative, please contact:
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FHWA-JPO-11-076

Photo Source: USDOT

DEDICATED SHORT-RANGE COMMUNICATIONS (DSRC)

THE FUTURE OF SAFER DRIVING

DSRC is a two-way short-to-medium range wireless communications capability that permits very high data transmission critical in communications-based active safety applications. In Report and Order FCC-03-324, the Federal Communications Commission (FCC) allocated 75 MHz of spectrum in the 5.9 GHz band for use by intelligent transportations systems (ITS) vehicle safety and mobility applications.

DSRC-based communications is a major research priority of the ITS Joint Program Office (JPO) at the U.S. Department of Transportation (USDOT) Research and Innovative Technology Administration (RITA). The cross-modal program is conducting research using DSRC and other wireless communications technologies to ensure safe, interoperable connectivity to help prevent vehicular crashes of all types and to enhance mobility and environmental benefits across all transportation system modes.

The USDOT's commitment to DSRC for active safety communications contributes to safer driving. Vehicle safety applications that use vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications need secure, wireless interface dependability in extreme weather conditions, and short time delays; all of which are facilitated by DSRC.

Who Can Develop DSRC Technologies?

DSRC developers could include device manufacturers; application developers; and representatives from the automotive, telecommunications, consumer electronics, and other industries whose products communicate alerts to vehicles, the infrastructure, or traveler's personal communication devices.

How Is DSRC Being Used?

V2V and V2I applications utilizing DSRC may have the potential to significantly reduce many of the most deadly types of crashes through real-time advisories alerting drivers to imminent hazards (such as veering close to the edge of the road, vehicles suddenly stopped ahead, collision paths during merging, the presence of nearby communications devices and vehicles, sharp curves, or slippery patches of roadway ahead).

Convenience V2I services like e-parking and toll payment are also able to communicate using DSRC. Private information from electronic sensors in vehicles and devices can also be transmitted over DSRC to provide better traffic and travel condition information to travelers and transportation managers.

A connected, safer transportation system includes, crash prevention and mobility applications.

Connected vehicle ITS applications provide connectivity:

- Among vehicles to help prevent
- crashes
- Between vehicles and infrastructure to enable safety, mobility, and environmental sustainability
- Among vehicles, infrastructure, and passengers' wireless devices to provide continuous real-time connectivity to all system users

DSRC technology behind crash prevention and mobility supports:

- Active safety transportation applications
- Reliable, secure communications
- Fast communication speed, low latency
- Invulnerability to extreme weather
- Tolerance of multi-path transmissions
- Technology based on standards to enable interoperability

DSRC enables the most reliable, high-speed, vehicle-based technology for crash prevention safety applications

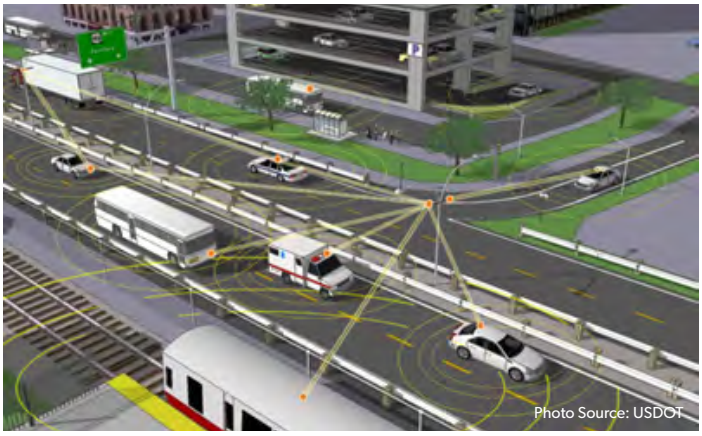
U.S. Department of Transportation

Research and Innovative Technology Administration

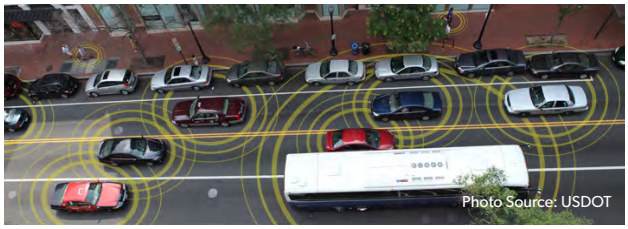
Why was DSRC Developed and to What Benefit?

DSRC was developed with a primary goal of enabling technologies that support safety applications and communication between vehicle-based devices and infrastructure to reduce collisions. DSRC is the only short-range wireless alternative today that provides:

- **Designated licensed bandwidth:** DSRC ensures secure, reliable communications. It is primarily allocated for vehicle safety applications by FCC Report and Order FCC 03-324.
- **Fast Network Acquisition:** Active safety applications require the immediate establishment of communication and frequent updates.
- **Low Latency:** Active safety applications must recognize each other and transmit messages to each other in milliseconds without delay.
- **High Reliability when Required:** Active safety applications require a high level of link reliability. DSRC works in high vehicle speed mobility conditions and delivers performance immune to extreme weather conditions (e.g., rain, fog, snow).
- **Priority for Safety Applications:** Safety applications on DSRC are given priority over non-safety applications.
- **Interoperability:** DSRC ensures interoperability, which is the key to successful deployment of active safety applications, using widely accepted standards. It supports both V2V and V2I communications.
- **Security and Privacy:** DSRC provides safety message authentication and privacy.



DSRC provides for a broad cross-section of dedicated connectivity options for surface transportation safety



DSRC-based communications serve as the basis for connected vehicle safety and mobility application integration.

Potential DSRC Transportation Applications for Public Safety and Traffic Management

- Blind spot warnings
- Forward collision warnings
- Sudden braking ahead warnings
- Do not pass warnings
- Intersection collision avoidance and movement assistance
- Approaching emergency vehicle warning
- Vehicle safety inspection
- Transit or emergency vehicle signal priority
- Electronic parking and toll payments
- Commercial vehicle clearance and safety inspections
- In-vehicle signing
- Rollover warning
- Traffic and travel condition data to improve traveler information and maintenance services

For more information about this initiative, please contact:
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FHWA-JPO-11-034